THE UNIVERSITY OF TEXAS AT AUSTIN
ENERGY AND WATER MANAGEMENT PLAN
FISCAL YEAR ENDED AUGUST 31, 2016

Progress Report

The University of Texas at Austin total energy utilization index (EUI – reported in btu/sf/yr) for the past 6 fiscal years (FY 2011 – FY 2016) has been reduced from 186,247 in FY 2011 to 177,396 in FY 2016 - a reduction of 5% and a reduction of 43% since 1997 while space grew 8.7 million GSF since 1997. Since 2006 water consumption has been reduced 13,300,000 gal while the campus grew by 4.1 million GSF. This and efforts to improve reliability, resilience, energy efficiency, the environment, operational effectiveness and contribution to customers has earned the campus the distinction of being the world's first university utility to achieve Performance Excellence in Electricity Renewal (PEER) certification by the USGBC and GBCI.

The effectiveness and efficiency of the utility system has allowed the campus to return to the same fuel use of 1976 while the campus grew by 9 million GSF. This was accomplished with only 4 campus wide electrical outages in 54 years.

Improvements to the power plant, chilling stations, electrical distribution and chilled water distribution system combined with improvements to demand side improvements in buildings have allowed us to achieve, and continue to maintain, utility consumption reductions including, such as but not limited to:

- A new 25 MW steam turbine
- A new 63,000 gpm cooling tower for the power plant.
- A replacement of a 13 MW 1969 combustion turbine with a new LM 2500 +G4 DLE 34 MW combustion turbine with heat recovery boiler.
- A new 15,000 ton chilling station (CS3) that was the country's most efficient cooling plant when constructed.
- A new 3.9 million gallon chilled water thermal storage (TES 1) facility that allows the shifting of 4 MW of electrical peak to night time and improves efficiency.
- An upgrade of the 50 MVA substation and power plant main breakers with a 100 MVA substation and new power plant main breakers with a digital SCADA system.
- A new 15,000 ton chilling station (CS7) and heating plants that can be expanded as needed to serve the Dell Medical District.
- A 5.5 million gallon chilled water energy storage facility (TES2) that will improve chilled water efficiency and shift up to 10 MW of peak electrical load to night time when combined with TES1. This system will allow the campus to grow without the addition of costly new electrical generation systems.
- A new digital load control system for the power and heating plant.
- New digital controls in the power plant and chilling stations.
- A TERMIS "real time" chilled water hydraulic model of the entire nine mile tunnel system that has allowed operational improvements to the chilled water distribution system.
- A "real time" thermal model of the entire energy production system that has allowed operational dispatch improvements.
- Inlet air chilled water coils for combustion turbines 8 and 10 that allow peak performance in the summer at the lowest fuel use.
- 11 LEED silver certified buildings since 2007.

- A state of the art Optimum Energy chilled water optimization system that has allowed UT to achieve and sustain year over year the country's highest chilled water production efficiency for a system of this size.
- Over 900 building meters that meter 95% of all campus buildings for electricity, steam, hot water, chilled water and domestic water use all linked centrally via fiber to allow actual building energy use and electronic billing of monthly energy use.
- Utilization of an Energy Management System. This system provides energy metering and management services such as automated, schedule-based temperature setback controls building HVAC systems.
- A continuous commissioning program in place to optimize the operation of control devices along with air conditioning, heating, ventilation, and building automation systems focusing on total building performance with an emphasis on optimum energy efficiency.
- Tracking of monthly energy usage in order to quickly identify and correct possible operational issues affecting energy consumption that can be digitally displayed on a campus energy portal.
- Lighting fixtures:
    - A gradual replacement to LED fixtures in designated areas during routine maintenance activities.
    - Attrition replacement of outdoor lighting fixtures with LED fixtures.
- Retrofitting of restrooms with low-flow toilets and lavatories, and automatic sensors to activate and shut off water flow.
- Upgraded heating and cooling system steam traps to capture and recirculate steam condensate.
- Utilization of native plant species on campus to minimize irrigation requirements and, therefore, water consumption.
- The implementation of a central irrigation system to assist in managing the irrigation usage across campus. The Main Campus central irrigation system detects breaks in the system and shuts down leaks within minutes, saving over 10 million gallons of water in 2012 with just that one feature. Since the implementation of the central irrigation system and new irrigation practices, irrigation usage on campus on the automated irrigation systems has dropped by 66%, resulting in an annual avoidance of over 100 million gallons.
- While the overall water use may not indicate these reductions overall potable water has gradually been replaced through the use of reclaimed water (treated sewage effluent) purchased from the city at reduced rate that is complementing the campus' use of recovered water (cooling coil condensate) so that around 30% of the water consumed by the energy plants is now non-potable water (100,000,000 gallons annually)
- A new 3,750 ton cooling plant and 800,000 gallon chilled water thermal energy storage facility was constructed to support the Texas Advanced Computing Center's new Stampede computer at the Pickle Research Center obtained a grant from Austin Energy to offset construction costs and consistently saves energy compared to conventional approaches.

Goals

UT System Board of Regents' utility conservation goals are a 5% reduction in energy consumption (btu/gsf) and a 3%-5% reduction in water consumption (gal/gsf) over a ten year period beginning with the baseline year of FY11.

Strategy for Achieving Goals

UT Austin plans to continue implementing the following measures to achieve these utility conservation goals:

- LED lighting retrofits
- High efficiency HVAC replacement units
- Optimizing HVAC operating parameters using new technology that uses "real time" building energy models to tune building energy use and identify energy conservation measures.
- On-going building energy usage monitoring, measurement, and evaluation (enhanced commissioning)
    - The new Campus Sustainability Plan of 2016 recognizes that "the investments in high performance buildings ensures the university provides an unequaled learning environment while maintaining the most energy and cost effective building portfolio. Additionally, investing in efficiency has reduced the institutional exposure to market spikes in energy or water and future resource pressures such as drought or emissions pricing."
        - So new and existing buildings will be influenced by a plan to improve design standards, the use of goal EUI standards for new buildings, improved strategies for building HVAC controls, enhanced use of new building and existing building commissioning, the use of "real time" building models, the use of "real time" optimization of building energy systems and a strategy to use energy savings to pay for more energy savings.
    - A new Demand Side Strategic Plan is in progress that is based on three topic areas of Existing Buildings, New Construction & Renovation and Conservation Behavior, since they address tasks outlined by the Campus Master Plan.
        - The mission of the plan is to:

          "Utilize innovative demand side energy management strategies to offset projected campus energy growth."

        - The goal of the plan is to:

          Reduce the average energy use intensity (EUI) on main campus by at least 2 percent annually.

Implementation Schedule

The majority of UT Austin's utility conservation measures are already in place and on-going.

Existing Buildings

As UT Austin renovates, remodels, and upgrades campus facilities, it continues to complete lighting retrofits, transformer upgrades, installation of occupancy sensors on lighting in rooms where feasible, replacement of older HVAC system components with higher efficiency models (to include, but not limited to, pump/fan motors, mixing boxes, air handler units, and chillers).

New Buildings

UT Austin has commissioned eight new LEED Certified buildings since 2007 with 10 additional pending certification or in construction. A new cooling/ heating plant (15,000 tons and 47 MMBtu

heating plant), 5.5 million gallon chilled water thermal energy storage facility and second 40 MMBtu backup heating plant were completed in 2016 to support the Dell Medical School and Seton Teaching Hospital.

Demand Side Master Plan

It is anticipated that this plan will be completed this year with a plan to use energy savings to create more savings/energy avoidance. This is supported by a formally developed M&V protocol that uses the extensive building metering system to validate actual energy use against a baseline, a Project Portfolio Management based project selection process to select the right project, a formal project management process to complete the process and a behavioral management program for building users complemented by three energy engineers and three building energy stewards.

Finance Strategy

UT Austin finances all plant improvements using the utility rate structure. The cost avoidance from prior utility system improvements have yielded a higher rate of return than the finance cost of the improvements. Cost savings realized by the improvements to our facility infrastructure provides the financial justification for continuation of this process in order to maximize the operating efficiency of the entire campus.

A redistribution of energy savings directly attributable to building energy savings will be requested to fund more savings and deferred maintenance and recapitalization projects that will further enhance utility consumption reductions will be sought in partnership with the campus.

The university purchases natural gas through a contract with the General Land Office. This agreement has allowed the campus to purchase at optimum periods the best pricing of natural gas that allows the campus to completely control the energy budget. All energy produced by the utility plants is produced from natural gas.

Gasoline Consumption

During FY15 the total gallons of gasoline used by our fleet vehicles was 144, 097.

Employee Awareness Plan

UT Austin strives to continuously remind students, faculty and staff to help conserve energy on campus by taking the following measures:

- Continuing the use of the “Longhorn Lights Our” program that encourages the campus to on a monthly basis turn off lights that is validated by logging in and tabulating savings.
- Monitor the temperature of the office environment (our EMS allows us to pre-set thermostat set points and set a defined temperature band width)
- Make sure office computers are in an “energy save” mode
- A new campus “Energy Portal” is in the process of being rolled out to campus that will allow the campus community on an ad hoc basis see annual EUI, CO_2, thermal and

electrical use, water use by building categories. It will also allow the campus to see individual building energy and water use on a “real time” and historical basis.

Designated Contact Persons

Responsible for reporting, submitting and implementation of the recommendations in the Energy and Water Management Plan:

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